DoD M&S Ocean Executive Agent Execution Plan

A. Purpose:

This execution plan outlines the general procedures by which the Department of Defense (DoD) Modeling and Simulation (M&S) Executive Agent (MSEA) for authoritative representation of the ocean environment conducts operations. It also lists the specific projects and initiatives appropriate to the execution of responsibilities.

B. General Authority and Responsibilities:

1. The Under Secretary of Defense for Acquisition & Technology (USD(A&T)) has designated the Department of the Navy as the DoD MSEA for authoritative representation of the ocean environment.

2. In fulfilling responsibilities under DoD Directive (DoDD) 5000.59 the MSEA must coordinate with other EAs, DoD Components, Federal Agencies, and various commercial sources.

3. DoDD 5000.59 defines a MSEA as a DoD Component to whom the USD(A&T) has assigned management responsibility and delegated authority for the development and maintenance of a specific area of M&S application, including relevant standards and databases, used by or common to many models and simulations.

4. In fulfilling its responsibilities the MSEA must:

    a. Foster interoperability and reuse as critical elements in establishing cost-effective capabilities to build and use synthetic environments.

    b. Facilitate the establishment and operation of a process by which M&S developers and users have a responsive means to acquire source data from a range of data producers.

    c. Serve the M&S community as a center of excellence for the specific area of M&S application, to include related dynamic processes.

5. In the execution of these responsibilities the MSEA shall be accountable through the Defense Modeling and Simulation Office (DMSO) to the Director, Defense Research and Engineering (DDR&E).

C. Definition of Domain Area of Responsibility:

The Ocean: The vast body of water that covers almost three fourths of the earth's surface, including the semi-enclosed seas.

    1. The Ocean includes:

        a. The liquid water and ice (sea and glacial) extending from the air/water interface to the sea floor.

        b. The sea floor from the deep ocean to the 10 meter depth as measured from the lowest low tide.

        c. The rock and sediment under the sea floor.

        d. Permanent man-made objects such as wrecks at depths greater than 10 meters, and their representations.

        e. Non-permanent, naturally occurring objects such as the deep scattering layer, whales, and bioluminescence producers, and their representations.

        f. Non-permanent, natural objects created by man-made effects such as ships' wakes, and their representations.

    2. The Ocean does not include:

        a. The liquid water and ice within the confines of the continental land masses. This area will be under the domain of the Terrain EA.

        b. That area of the sea floor in water shallower than 10 meters as measured from the lowest low tide. This area will be under the domain of the Terrain EA.

        c. The atmosphere immediately above the ocean surface. This area will be under the domain of the Atmosphere EA.

        d. Non-permanent, man-made objects which move through the ocean such as ships and oil rigs, and their representations.

D. Background or Baseline Assessment:

The importance of the ocean environment in M&S is not always as apparent as the terrain or the aerospace environment. Nevertheless, no realistic simulation involving Naval components or joint forces in littoral regions

can be conducted without an in-depth understanding of the ocean environment and its effects on platforms, weapon systems and sesnors. This point was well illustrated during the ARPA sponsored Maritime Simulation Demonstration of Undersea Technologies, conducted in September 1993. The inclusion of a realistic high resolution ocean environment had such a significant effect on acoustic detection ranges that the entire exercise scenario had to be modified. To achieve the exercise objectives while maintaining environmental realism, a winter ocean environment had to be used in an exercise that took place in September.

There are numerous ocean and ocean acoustics modeling efforts taking place at several naval laboratories, primarily the Naval Research Laboratory, and at numerous academic institutions and industry. Oceanographic and ocean acoustic data are collected and processed primarily by the Naval Oceanographic Office (NAVOCEANO) and is augmented by data from many other sources, including foreign sources. In the absence of universally accepted validation and verification standards, proliferation of models and data has created questionable standards of accuracy and consistency. The Oceanographic and Atmospheric Master Library (OAML) was conceived, established and is being maintained to promote the accuracy and consistency required of these environmental products and is at present the only source of validated ocean data and models. Compliance with the OAML process of validation and verification will be critical in selecting candidate ocean-related models and data bases for use by the M&S community.

The present baseline data collection and modeling efforts are focused primarily on operational or R&D use. They are not geared for large scale interactive simulations which require a high degree of compatibility, interoperatbility and a common architecture for data transmission. Consequently, while the present on-going efforts have provided a strong foundation for providing the ocean environmental support to the M&S community, additional work, as described in Appendix 3, is required to satisfy the M&S customer needs.

E. Objectives:

1. Under the concept of "Train as you fight", M&S must be an integral part of real-world military operations. It is the goal of the OEA to develop, disseminate, and use simulations, models and data bases and C4I that support all Service components in real-world operations, as well as in research and development, acquisitions, and test and evaluation. Emphasis will be placed on coastal, shall water, and semi-enclosed seas in order to support the DoD in cross-service littoral warfare.

2. The procedures and projects outlined in this plan have as the primary objective ensuring that authoritative representations of the ocean environment are defined and accessible to the DoD M&S analysis, acquisition, and training communities.

3. These common representations, supporting software tools, and algorithms must be:

a. Reusable to the largest extent possible to promote interoperability and cost savings.

b. Accessible to simulation developers and simulation users in a timely and efficient manner through a resource repository system in standard data and metadata formats retrievable through common interchange format.

c. Based on broadly accepted standards that can be used by a range of government and/or commercial producers to meet area coverage and production timeline requirements.

d. Appropriately verified, validated and certified/accredited.

4. The MSEA role in the standardization and development process is generally that of facilitator in the project startup phase, catalyst during development, and certifier in the capability delivery phase.

F. Business Model:

1. The following process will be used to guide execution program development, project selection, oversight, and evaluation.

a. M&S community CUSTOMERS must be identified through an aggressive outreach program.

b. Customer REQUIREMENTS are gathered through hands-on participation with M&S system developers and users.

c. Requirements analysis identifies broadly-applicable ISSUES with potentially high payoff.

d. A STRATEGY is developed that addresses these issues, leveraging other projects/funding sources where appropriate.

e. Specific TASKS are defined to execute the strategy and achieve the required capabilities.

f. Each task must be FUNDED at a level that delivers timely results.

g. The funded projects produce DELIVERABLES that provide customer defined capabilities while achieving the previously stated objectives.

2. This business model demands continuous dialogue with, and feedback to, the customer.

3. The process is not complete until a migration plan for each deliverable is established. This migration plan must address the delivery of a capability to a customer. It must also address the process by which a product definition, standard, or procedure is coordinated with and adopted by the larger M&S community, including its production base.

4. Throughout this process, maximum effort is made to use established international, national, commercial, or DoD standards and procedures.

5. The MSEA may execute some of its responsibilities and achieve some of its objectives by working through other government or industry organizations.

G. Prototyping:

In general, prototyping is a central element of MSEA strategy. Prototyping activities fall into the following main areas:

- To test existing products in new applications.

- To define new product content and design.

- To study transformation processes to show producers where product redesign can eliminate user modification and promote expanded reuse and improve consistency.

- To study database generation techniques to seek out critical areas where promoting investment will improve database generation time and quality.

- To evaluate verification, validation, data certification, and model accreditation procedures and tools.

H. General Guidance:

This execution plan conforms to the general guidance obtained from the Issues and Actions contained in the DoD M&S Master Plan (DoD 5000.59-P) Sub-objective 2-2. They define M&S community wide activity areas which the MSEA will be required to report on periodically to the M&S Working Group and the Executive Council on M&S. In the event of a contradiction between this document and the DoD MSMP, the MSMP shall take precedence.

     1. Issues:

        a. Definition of user community requirements in terms of the required data content, levels of resolution, accuracy and fidelity for ocean representation (3.a.(1)).

        b. Availability of source data (such as bottom conditions, surface data, and the water column) (3.a.(2)).

        c. Development of standard, correlated, representations of the oceans (3.a.(3)).

        d. Identification and development of coordinated, cost-effective capabilities to produce certified oceanographic data (3.a.(4)).

        e. Development of authoritative process representations for the oceans to include natural and man-made effects (3.a.(5)).

        f. Development of a capability to interoperate and scale oceanographic models (3.a.(6)).

     2. Actions:

        a. Determine expected availability of source data and develop plans to meet any anticipated shortfall by appropriate liaison starting in FY96 (3.b.(1)).

        b. Develop authoritative oceanographic prototype data sets to support M&S activities (3.b.(2)).

        (1) Select geographic areas in FY96 (as required for littoral region interaction) and oceanographic conditions for prototyping (3.b.(2)(a)).

        (2) Specify the data resolution levels, fidelity, and accuracy required to support M&S functional areas starting in FY96 (3.b.(2)(b)).

        (3) Develop data dictionaries for the feature content and attribution requirements of each appropriate M&S resolution level starting in FY96 (3.b.(2)(c)).

(4) Define, starting in FY96, the data structure, coding, and attribution scheme, symbology, and metadata requirements (3.b.(2)(d)).

(5) Generate oceanographic prototype data sets by second quarter FY96 (3.b.(2)(e)).

c. Once developed, make all ocean representations available to the M&S community through the resource repository system. Initiate in FY96. Ongoing (3.b.(3)).

d. Nominate data exchange standards to ASD(C^{3}I), as required, by second quarter FY96 (3.b.(4)).

e. Demonstrate the capability to generate and/or receive and apply data updates to standard oceanographic data bases from multiple sources and document the configuration control process required by FY97 (3.b.(5)).

f. Develop authoritative oceanographic process representations to include the interface with associated terrain and atmospheric effects (e.g., littoral region shoreline, bottom, and wind conditions) for selected M&S functional areas (3.b.(6)).

(1) Define an initial set of standard and dynamic process representations for the ocean environment in virtual and constructive simulations by FY97 (3.b.(6)(a)).

(2) Establish enhanced standard oceanographic process representations by FY98 (3.b.(6)(b)).

(3) Define and develop process representations for natural and man-made perturbations on oceanographic representations by FY98 (3.b.(7)(c)).

g. Develop a standard methodology for understanding and managing the effects of interconnecting simulations using oceanographic models of differing resolution by FY98 (3.b.(8)).

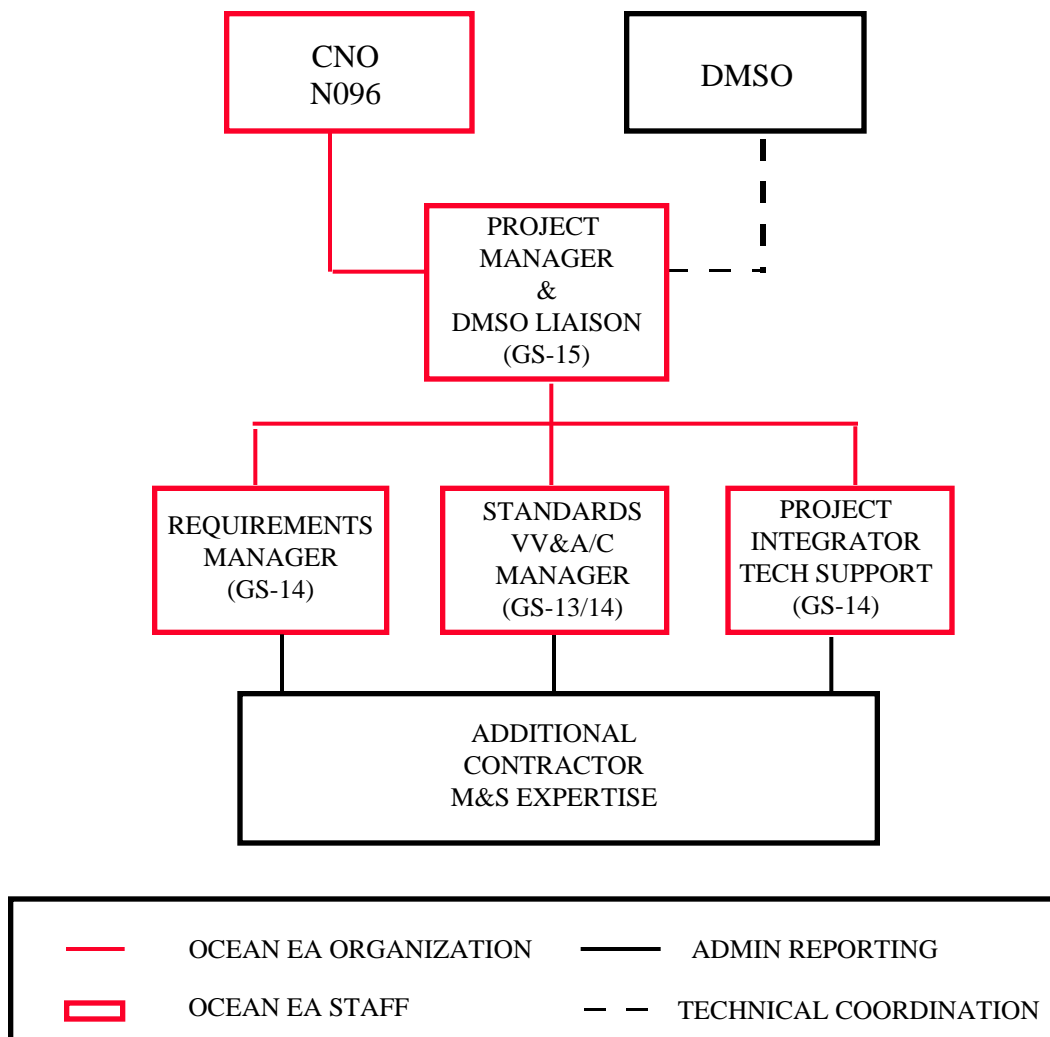**I. MSEA Office Organizational Structure:**

The Oceanographer of the Navy accepted the mission, role and responsibilities of the Ocean EA as defined by the DoD MSMP and created a program office called the Ocean EA Office to carry out the functions of the Ocean EA. This program office obtains funds from the Chief of Naval Operations, N096, to carry out DoD-wide and ocean-related M&S support. The

N096 staff also acts as a conduit for Navy-related atmospheric and space M&S support from the DoD Aerospace Executive Agent (U.S. Air Force).

The MSEA will provide the personnel and funding commensurate wtih the requirements and obligations of the MSEA's responsibilities as discussed in the DoD MSMP. The MSEA will set up a project infrastructure to lead a cooperative M&S community team. This infrastructure will rely on both the operational and the R&D capabilities within the Oceanographer of the Navy's organization.

There is a close tie-in with operational and R&D commands. Expertise and capabilities available at these commands will be leveraged to the greatest extent possible. The staff of the Oceanographer of the Navy will integrate the operational, R&D and Ocean EA programs under the direction of the N096 Technical Director (N096T) and DMSO.

The Ocean EA Office is located on the grounds of the Naval Research Laboratory, Washington, DC (NRL-DC) under the management of a Program Manager at the GS-15 level. Three branches, Requirements, Standards and V&V, and Program Integration, will support the Ocean EA program by managing major programmatic thrusts aggregated from the actions delineated within the DoD MSMP. This infrastructure allows the Ocean EA to delegate program management responsibility and accountability to the specific, full-time Ocean EA staff. Contractor support will be hired when and where necessary to facilitate successful program completion.

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          CNO                        DMSO
          N096

                      PROJECT
                      MANAGER
                        &
                    DMSO LIAISON
                      (GS-15)

     REQUIREMENTS     STANDARDS      PROJECT
       MANAGER        VV&A/C        INTEGRATOR
       (GS-14)        MANAGER      TECH SUPPORT
                     (GS-13/14)       (GS-14)

                      ADDITIONAL
                      CONTRACTOR
                    M&S EXPERTISE
```

——— OCEAN EA ORGANIZATION	——— ADMIN REPORTING	
☐ OCEAN EA STAFF	– – TECHNICAL COORDINATION	

J. Appendices:

1. Customer List

2. Program Area Descriptions

3. Detailed Project List

4. References

5. Definitions and Acronyms

APPENDIX 1

CUSTOMERS AND DATA REQUIREMENTS

A customer is defined as anyone who could use the OEA services to improve simulations. These services can range from providing the required data to the customer, to providing information where the data can be obtained, to facilitating transfer of data from a data provider to the customer. By this definition, the data providers are also the OEA customers. The following list of OEA customers and their data requirements was compiled from previous surveys conducted by the *E2dis* project and augmented by requirements identified at a special OEA Requirements Workshop held for that purpose. The primary customers included in this list are Joint programs, the Service components, and major programs that are already being funded by DMSO. These include JSIMS, JWARS, JMASS, JCOS, STOW, JLOTS, JCS(J8) and individual Services. Most of the OEA support to these customers will be through the data providers and projects specified in the list.

Providers and projects that were selected by the OEA for funding (in **bold face** type) are those with a "short term" payoff to the primary DMSO customers and DOD Service components. They were prioritized based on the greatest visibility and impact. The MEL project for example, which will directly support several of the top DMSO programs, was given top priority. Many of the remaining providers and projects would fall under the "potential" customer category. This is because many of the present generation simulators and trainers cannot utilize environmental data although there is a universal agreement that enhanced realism could be achieved if they were capable of using such data. One of the major tasks of the OEA will be to persuade these customers that the next generation of simulators should be designed to include environmental effects and to facilitate this design whenever possible. As part of the OEA's *Education, Training and Outreach* program, the OEA will meet on a continuing basis with these customers to identify specific issues and to determine if any of the projects should be funded or leveraged by DMSO or the OEA in future years. New customers will be added to this list as the OEA's *Requirements Definition* program matures.

This chapter concludes with a list of providers and projects for each of the OEA customers identified as of this date. A glossary of accronyms and abbreviations for the terms used in this list is provided in Appendix 5.

OEA CUSTOMERS AND DATA REQUIREMENTS

CUSTOMER: JSIMS

PROVIDER	PROJECT	DATA REQUIRED
NRL	**MEL**	Global, Regional, Littoral and Local Oceans
Monterey, CA		Ocean Surface: All Available Data
		Ocean Sub-Surface: All Available Data

CUSTOMER: JWARS

PROVIDER	PROJECT	DATA REQUIRED
NRL	**MEL**	Global, Regional, Littoral and Local Oceans
Monterey, CA		Ocean Surface: All Available Data
		Ocean Sub-Surface: All Available Data

CUSTOMER: JMASS

PROVIDER	PROJECT	DATA REQUIRED
NRL	**MEL**	Global, Regional, Littoral and Local Oceans
Monterey, CA		Ocean Surface: All Available Data
		Ocean Sub-Surface: All Available Data

CUSTOMER: JCOS

PROVIDER	PROJECT	DATA REQUIRED
CERC/NRL	**LOTS**	Littoral Oceans
Vicksburg, MS		Ocean Surface: Sea State, Water Level, Temperature, Wave Heights, Currents
		Ocean Sub-Surface: Bathymetry, Temperature, Transparency, Currents
Coastal Systems Station	**Distributed SZ**	Littoral Oceans
Panama City, FL	**Modeling**	Ocean Surface: Water Level, Currents, Temperature, Sea State, Wave Heights
		Ocean Sub-Surface: Currents, Temperature, Transparency
U.S. Army, TEC	**ICTDB**	Littoral Oceans
FT Belvoir, VA		Ocean Surface: Sea State, Water Level, Temperature, Currents, Wave Heights
		Ocean Sub-Surface: Bathymetry, Temperature, Transparency, Currents

CUSTOMER: JCS (J8)

PROVIDER	PROJECT	DATA REQUIRED
Argonne National Lab	DEEM	Global Oceans
Argonne, IL		Ocean Surface: Sea State, Water Level, Wave Heights

CUSTOMER: STOW/ARPA

PROVIDER	PROJECT	DATA REQUIRED
TASC	**TAOS**	Global, Regional, Littoral and Local Oceans
Reading, MA		Ocean Surface: All Available Data
		Ocean Sub-Surface: All Available Data
NRL, Washington, DC	**E2dis/TOSL**	Global Oceans
NRL, Stennis Space Cen.		Ocean Surface: All Available Data
		Ocean Sub-Surface: All Available Data

CUSTOMER: JLOTS

PROVIDER	PROJECT	DATA REQUIRED
CERC/NRL Vicksburg, MS	**LOTS**	Littoral Oceans Ocean Surface: Sea State, Water Level, Temperature, Wave Heights, Currents Ocean Sub-Surface: Bathymetry, Temperature, Transparency, Currents
Coastal Systems Station Panama City, FL	**Distributed SZ** **Modeling**	Littoral Oceans Ocean Surface: Water Level, Currents, Temperature, Sea State, Wave Heights Ocean Sub-Surface: Currents, Temperature, Transparency

CUSTOMER: ARMY

PROVIDER	PROJECT	DATA REQUIRED
Coastal Systems Stn Panama City, FL	**Distributed SZ** **Modeling**	Littoral Oceans Ocean Surface: Water Level, Currents, Temperature, Sea State, Wave Heights Ocean Sub-Surface: Currents, Temperature, Transparency
U.S. Army, TEC FT Belvoir, VA	**ICTDB**	Littoral Oceans Ocean Surface: Sea State, Water Level, Temperature, Currents, Wave Heights Ocean Sub-Surface: Bathymetry, Temperature, Transparency, Currents

CUSTOMER: AIR FORCE

PROVIDER	PROJECT	DATA REQUIRED
Aeronautical Sys. Center Wright-Petterson AFB	MERIT	Global, Regional, Littoral and Local Oceans Ocean Surface: Sea State, Temperature, Currents, Wave Heights
WL/AAR1-1 B22 Wright-Patterson AFB	AE*MAT	Global, Regional, Littoral and Local Oceans Ocean Surface: Sea State, Currents, Wave Heights
ESC/AVB Hanscom AFB	CTAPS	Regional, Littoral and Local Oceans Ocean Surface: Sea State, Currents, Wave Heights

CUSTOMER: COAST GUARD

PROVIDER	PROJECT	DATA REQUIRED
U.S. Coast Guard Martinsburg, WV	CASP	Global, Littoral and Local Oceans Ocean Surface: Sea State, Temperature, Currents, Wave Heights Ocean Sub-Surface: Temperature, Transparency, Currents
NAWC-TSD Orlando, FL	HH-30J	Littoral Oceans Ocean Surface: Sea State, Wave Heights

CUSTOMER: MARINE CORPS

PROVIDER	PROJECT	DATA REQUIRED
CNA Alexandria, VA	MWARS	Littoral Oceans Ocean Surface: Sea State, Wave Heights, Currents
MARCOR SYSCOM (AW), Quantico, VA	DFO/MULE	Littoral Oceans Ocean Surface: Sea State, Wave Heights, Currents
MARCOR SYSCOM (AW), Quantico, VA	EES	Littoral and Local Oceans Ocean Surface: Sea State, Wave Heights

PROVIDER	PROJECT	DATA REQUIRED
NAWC-TSD Orlando, FL	TTES	Regional Oceans Ocean Surface: Sea State, Wave Heights
NCCOSC NRaD San Diego, CA	MTWS	Littoral and Local Oceans Ocean Surface: Sea State, Wave Heights, Currents

CUSTOMER: NAVY

PROVIDER	PROJECT	DATA REQUIRED
NUWC Carderock, MD	**Wavemaker**	Global Oceans Ocean Surface: Wave Heights, Sea State
NAVAIR/PMA-264 Arlington, VA	**GASS**	Global, Regional and Local Oceans Ocean Sub-Surface: Acoustic Data
ARL/UT Austin, TX	BFTT (IV&V)	Global, Regional, Littoral and Local Oceans Ocean Sub-Surface: All Available Data
NUWC Newport, RI	FAS Shore Based Trainer	Regional and Local Oceans Ocean Sub-Surface: Acoustic Data
NCCOSC NRaD San Diego, CA	SEWSIM	Global, Regional, Littoral and Local Oceans Ocean Surface: Sea State, Wave Heights
NWAD, Corona, CA	TEMPAR(APL) EREPS, IREPS, PRO and DSC (NCOSC)	Littoral Oceans Ocean Surface: Sea State, Wave Heights
Fleet Combat Systems Training Center, LANT Currents Virginia Beach, VA	TACDEWEGCS	Littoral Oceans Ocean Surface: Sea State, Wave Heigh Ocean Sub-Surface: Transparency, Currents
NAWC AD Patuxent River, MD	MFS	Regional and Local Oceans Ocean Surface: Sea State, Wave Heights, Currents
Naval Surface Warfare Center, Dalgreen, VA	VLSTRACK	Global Oceans Ocean Surface: Sea State, Wave Heights, Currents Ocean Sub-Surface: Currents, Acoustic Data
NCCOSC NRaD Code 44201 San Diego, CA	RESA	Global, Regional, Littoral and Local Oceans Ocean Surface: All Available Data Ocean Sub-Surface: All Available Data
TACTRAGRUPAC San Diego, CA	ENWGS	Global, Regional, Littoral and Local Oceans Ocean Surface: All Available Data Ocean Sub-Surface: All Available Data
NUWC Newport, RI	CSEAL CSS	Regional, Littoral and Local Oceans Ocean Surface: All Available Data Ocean Sub-Surface: All Available Data
NASC Arlington, VA	HMMRSS	Global, Regional, Littoral and Local Oceans Ocean Surface: Sea State, Wave Heights

NAWC WD (Code P22305) Point Mugu, CA	IRIAM	Global, Regional and Local Oceans Ocean Surface: Sea State, Wave Heights
Combat Systems TRAGRULANT Norfolk, VA	CSMWTS	Littoral and Local Oceans Ocean Surface: All Available Data Ocean Sub-Surface: All Available Data
NUWC Newport, RI	WAF	Global Oceans Ocean Surface: Wave Heights, Sea State Ocean Sub-Surface: Acoustic Data
TACTRAGRULANT Virginia Beach, VA	ENWGS	Global, Regional, Littoral and Local Oceans Ocean Surface: All Available Data Ocean Sub-Surface: All Available Data
Coastal Systems Stn Panama City, FL	MARS	Littoral Oceans Ocean Sub-Surface: Currents
NASC (AIR-2,5M) Arlington, VA	TAMPS	Global Oceans Ocean Surface: Wave Heights, Sea State, Currents
NSWC Bathesda, MD	NABEM II	Littoral Oceans Ocean Surface: Wave Heights, Sea State, Currents
SCCIWI (SPAWAR) Arlington, VA	CWM 3.4.0	Littoral Oceans Ocean Surface: All Available Data Ocean Sub-Surface: All Available Data
JHU/APL Laurel, MD	AEGIS AN/SPY-1A/B/D Firm Track Simulator	Global Oceans Ocean Surface: Sea State, Wave Heights
Lockheed Martin Corp. Moorestown, NJ	AEGIS RSCES	Littoral Oceans Ocean Surface: Sea State, Wave Heights
JHU/APL Laurel, MD Currents	Cruise Missile Mission Planning & Weapon Control System TLAM	Global, Regional, Littoral and Local Oceans Ocean Surface: Sea State, Wave Heigh
NAWC-TSD Orlando, FL	F-14D Training System	Regional Oceans Ocean Surface: Sea State, Wave Heights
SCCIWI (SPAWAR) Arlington, VA	ITEM	Global, Regional, Littoral and Local Oceans Ocean Surface: Sea State, Wave Heights
JHU/APL Laurel, MD	NSS	Global, Regional, Littoral and Local Oceans Ocean Surface: All Available Data Ocean Sub-Surface: All Available Data

SAIC Arlington, VA	TBIP Mission Planning Perf. Prediction	Littoral Oceans Ocean Surface: Sea State, Wave Heights
NSWC Indian Head, MD	ITI	Littoral Oceans Ocean Surface: Sea State, Wave Heights, Temperature, Acousti Data
Naval War College Newport, RI	ENWGS	Global, Regional, Littoral and Local Oceans Ocean Surface: All Available Data Ocean Sub-Surface: All Available Data
Alliant Techsystems Arlington, VA	HF-ATSS	Local Oceans Ocean Sub-Surface: Acoustic Data, Bathymetry, Sound Velocity Profile

APPENDIX 2

PROGRAM AREA DESCRIPTIONS

The M&S program is divided into five major thrusts which outline a logical methodology for taking the OEA M&S program from determining customer requirements to facilitating data base and model development to testing the use of oceanographic representations through participating in M&S exercises to providing successful products to the M&S community. The OEA program leverages current operational and R&D capabilities and takes advantage of the expertise in the contractor/laboratory/academic world. The customer will have access to results at all stages of this M&S program, and the OEA will receive feedback from its M&S customers as well. Figure 2 shows a cartoon rendering of the OEA M&S program.
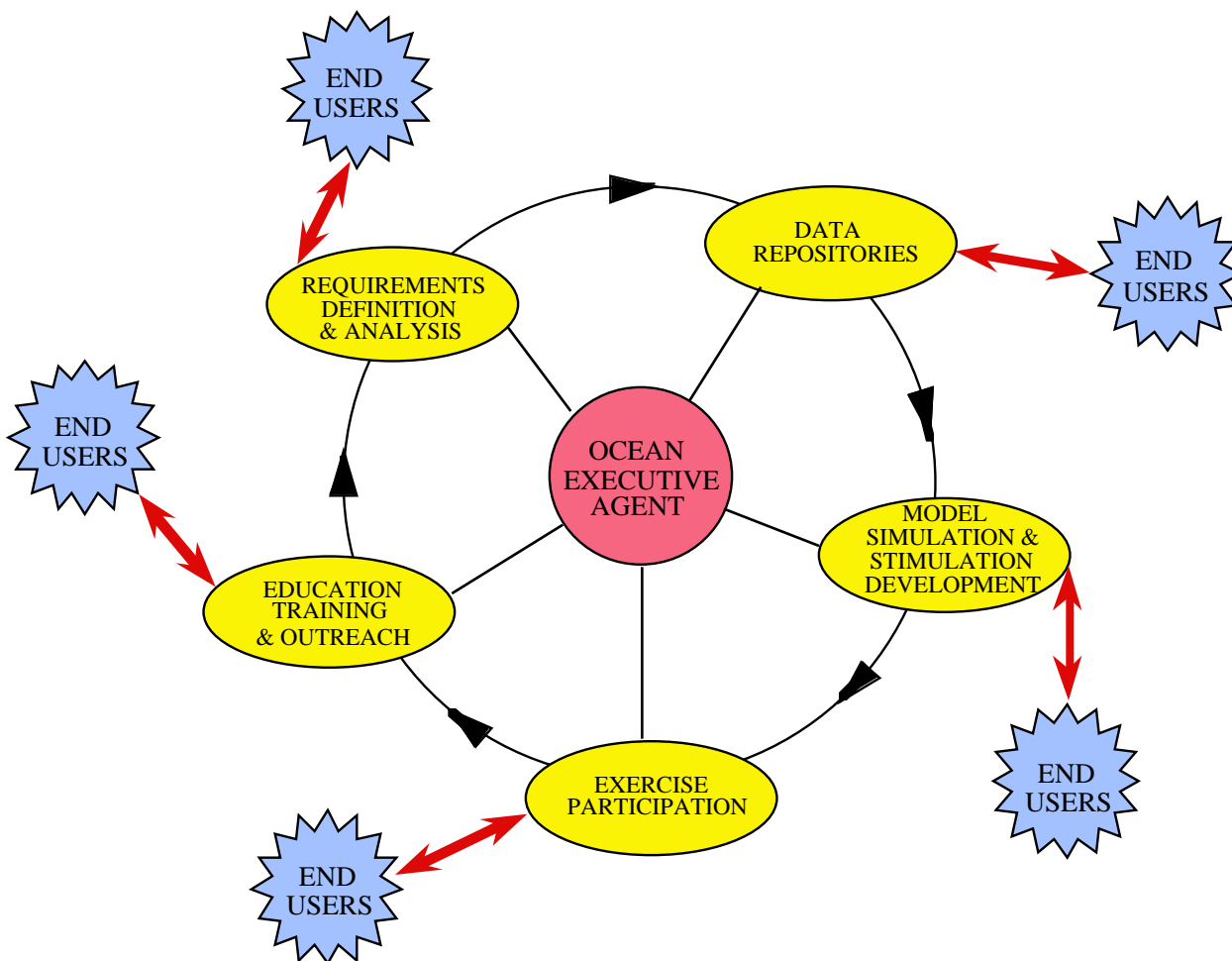

Figure 2. OEA Program Thrusts

The five major thrusts of the Oceanographic Modeling and Simulation Program are:

1. REQUIREMENTS DEFINITION AND ANALYSIS (RDA)

a. Purpose - To determine oceanographic support required by the M&S customers. This includes M&S applications requiring ocean data, the specific data resolution levels, fidelity, and accuracy required to support these applications in their functional areas. Additionally, the OEA must formalize the oceanographic M&S requirements process and develop metadata requirements and data structure, coding and attribution schemes. One of the major tasks of this program thrust is to quantify the effects of ocean environment on sensors, weapons and tactics through M&S.

b. Scope - This program will take advantage of earlier efforts such as E2dis and MEL surveys and operational arenas, as well as leveraging off of other similar M&S programs (such as the various M&S management offices – NAVMSMO, MCMSMO, DONMSMO, TMPO, etc.) to gather and assess ocean requirements to support the M&S community. It will further perform what additional activities are required to gather the information necessary to meet the demand for ocean-related data by the M&S community. These include workshops, surveys, and follow-up activities on a program-by-program and agency-by-agency level.

c. Responsibilities - The primary responsibility for this program thrust rests with the Requirements Manager assigned to the OEA office. Other DOD Services and appropriate agencies (Coast Guard, NOAA, NASA, etc) will be interviewed to determine/establish these M&S requirements and in so doing, build our customer base. Additional support will come from other DOD service personnel and contractors. This program will work with, and depend heavily on the cooperation of DOD Components and non-DOD agencies to successfully complete the tasks outlined in this Plan. Requirements established from prior DMSO-sponsored programs will be leveraged and incorporated into the project plan.

d. DOD M&S Goals of this Program Thrust:

(1) Review all ongoing DOD M&S projects/programs relating to the ocean for feasibility of immediately adopting the high-level architecture.

(2) Define customer requirements in terms of the required data content, levels of resolution, accuracy and fidelity for ocean representation.

(3) Plan, program, and budget for the fielding and connectivity of ocean-related data bases, models, and simulations.

(4) Develop metrics to assess the utility of related ocean products.

2. <u>DATA REPOSITORIES (DR)</u>

      a. <u>Purpose</u> - To develop capabilities to rapidly, efficiently and economically provide ocean data at several standard M&S resolution levels using state-of-the-art computer assisted feature extraction techniques and depict that data in multi-dimensional, dynamic representations.

      b. <u>Scope</u> - Authoritative ocean data representations are important inputs to all sensor performance models, effects models, simulations, stimulations and analyses. The OEA will leverage the substantial data collection, archiving, and assessment capability residing at NAVOCEANO and other ocean data collection and archiving agencies to supply the most physically consistent and realistic, real-time and historical data fields to the ocean-related models and simulations.

      c. <u>Responsibilities</u> - Responsibility for this program thrust resides with the Standards Manager assigned to the OEA office. Support will be provided to and expected from DOD Components and non-DOD agencies (industry, academia, and laboratories) to successfully complete the tasks outlined in this Plan.

      d. <u>DOD M&S Goals of this Program Thrust:</u>

      (1) Determine expected availability of source data and develop plans to meet any anticipated shortfalls by appropriate liaison.

      (2) Develop authoritative oceanographic prototype data sets to support M&S activities.

      (3) Make all ocean representations available to the M&S community through the resource repository system.

      (4) Define interoperable data exchange standards between the M&S and the ocean communities and design prototype ocean products to test and evaluate those standards in M&S environments. Data exchange standards will conform to the SEDRIS architecture.

      (5) Demonstrate the capability to generate and/or receive and apply data updates to standard oceanographic data bases from multiple sources and documenting the configuration control process required.

      (6) Develop standards and procedures for V&V.

      (7) Develop data certification standards and procedures, to include metrics to describe data quality.

(8) Connect to a communications infrastructure adequate to meet M&S user needs for accessing and utilizing the repository.

3. <u>MODEL SIMULATION AND STIMULATION DEVELOPMENT (MSSD)</u>

a. <u>Purpose</u> - To provide existing ocean application software tools to support common ocean applications in M&S environments and to develop, establish, and provide authoritative ocean process representations and models for common M&S ocean interaction as well as ocean depiction. The OEA will maintain a readily available library of these models and processes, develop, establish, and provide standard representations for dynamic ocean effects, and identify, certify, and exercise trusted producers of standard M&S ocean products and services as well as verification of the integrity and accuracy of their output.

b. <u>Scope</u> - This program will take advantage of the existing operations/R&D infrastructure to bring R&D and operational models and simulations into the M&S community. It is this leveraging that will ensure success in completing the tasks outlined in this Plan. Missions supported include the full range of M&S functional areas, for the full scope of M&S from the campaign/theater level to the subsystem/component level, and include training models and simulations with pre-planned scenarios, real-time data and effects models for use in mission rehearsals, acquisition and analysis models.

c. <u>Responsibilities</u> - Responsibility for this program thrust lies with the Project Integrator with additional contractor support. The Project Integrator, under the direction of the Project Manager, will work with the existing operations/R&D infrastructure to bring R&D and operational models and simulations into the M&S community. VV&A for new and existing models and simulations will be under the responsibility of the Standards Manager. The M&S Project Manager ties together the "team" and leverages the operational and R&D expertise throughout Navy and DOD.

d. <u>DOD M&S Goals of this Program Thrust:</u>

(1) Make all ocean system representations available to the M&S community through the Resource Repository System.

(2) Develop authoritative oceanographic process representations to include the interface with associated terrain and atmosphere effects for selected M&S functional areas.

(3) Develop a standard methodology for understanding and managing the effects of interconnecting simulations using oceanographic models of differing resolutions.

(4) Develop the system models and simulations required to satisfy the full range of DOD needs.

(5) Develop standards, procedures, and standardized tools to support VV&A of models and simulations.

(6) Connect to a communications infrastructure adequate to meet M&S user needs for porting models and simulations between activities.

(7) Increase the utility of existing and future models and simulations by making them DIS-compliant.

(8) Identify M&S cost drivers relating to the ocean and developing cost-effective fielding options.

4. <u>EXERCISE PARTICIPATION (EP)</u>

a. <u>Purpose</u> - To interface with M&S system operators to test and evaluate prototype ocean products in operational M&S environments, and support major exercises with customized data and on site technical expertise.

b. <u>Scope</u> - This program aims to ensure successful participation in ACTDs and other joint activities. ONR's expertise in supporting ocean-related exercises will be leveraged to provide proof of concept test plans, evaluations, exercise analyses, and the other tasks outlined in this Plan.

c. <u>Responsibilities</u> - Responsibility for this task rests with the Project Integrator with various operational and contractor support. The Project Integrator will work closely with the ONR, NRL, and with other Navy and DOD (e.g., ARPA) exercise planners to ensure successful participation in joint activities.

d. <u>DOD M&S Goals of this Program Thrust:</u>

(1) Identify notional requirements for distributed simulation exercises.

(2) Provide oceanographic support for the planning, set-up, and execution of distributed simulation exercises in an operationally responsive, cost-effective manner.

(3) Maintain information for obtaining M&S oceanographic support in the resource repository system.

(4) Coordinate outside demands and requirements in terms of capability and accessibility to DMSO.

(5) Work with the M&S Coordinating Committee (MSCC) to plan and coordinate use of distributed simulation assets.

(6) Demonstrate authoritative oceanographic process representations to include interface with associated terrain and atmospheric effects for selected M&S functional areas.

(7) Collect and analyze data from ongoing efforts, planned experiments and demonstrations to assess the impacts of M&S, and providing results to DMSO.

5. <u>EDUCATION, TRAINING AND OUTREACH (ETO)</u>

a. <u>Purpose</u> - To represent M&S oceanographic interests at appropriate DOD, national, industry and international standardization and interoperability forums, have direct interface with M&S system operators to enhance user awareness of available ocean products and services, assist operators in the exploitation of ocean data on M&S systems, and, in general, move ocean product standards into the M&S world. As part of the Outreach portion of this program, the OEA will interface with DOD and non-DOD government agencies, laboratories, industry, and academia to determine the availability of, and acquire if possible, advanced and in otherways useful M&S programs.

b. <u>Scope</u> - Under this program, the Ocean Executive Agent Office will be a conduit for releasing ocean-related papers and reports to the M&S community. Representatives of this office will attend seminars and forums, and technology exchange meetings, provide education and training programs, and furnish the operational support required to successfully complete the tasks outlined in this Plan.

c. <u>Responsibilities</u> - The Project Manager will be responsible for this program thrust. The Project Manager, or his designated representative, will attend seminars and forums, and technology exchange meetings. He will be assisted in this task by the N096 M&S Action Officer.

d. <u>DOD M&S Goals of this Program Thrust:</u>

(1) Develop and maintain information papers on M&S in the ocean environment.

(2) Conduct and participate in seminars, symposia, and workshops on M&S.

(3) Conduct regular and frequent technology and exchange meetings to facilitate the widest distribution of information on new oceanographic support for the M&S community.

(4)   Invite other government agencies, industry, universities and allied nations to observe or participate in M&S experiments and demonstrations, seminars, workshops, and international working groups related to supporting the M&S ocean environment.

APPENDIX 3

DETAILED PROJECT LIST

Results from previously conducted, as well as on-going surveys have been used in conjunction with a workshop and face-to-face discussions to obtain M&S oceanographic requirements. Existing capabilities will be matched with requirements assessments to determine the M&S strengths, weaknesses and opportunities for improvement and to identify projects for inclusion into the POM cycle.

Limited funds and time constraints place restrictions on the amount of work the OEA can accomplish each year. The funding constraints come about naturally in this period of reduced defense spending. The time constraints are mandated by up-coming ARPA exercises and Advanced Concept Technology Demonstrations (ACTDs) where the OEA wants to be a contributor. This Execution Plan establishes an investment strategy and timelines that are realistic within the constraints of these fiscal and temporal limitations.

In order to maximize available resources while providing for the immediate requirements of the M&S community, near- and long-term objectives have been established. Near-term objectives concentrate on determining oceanographic requirements of the M&S community, particularly in the littoral region, and meeting the needs of upcoming exercises and demonstrations, while long-term objectives focus on meeting research, validation and verification, and standards compliance goals.

Formulation of a long-term investment strategy will be based on the results of the OEA's Requirements Definition and Analysis and Outreach programs, and will be guided by the funding levels identified in this appendix. The OEA's long-term funding strategy extends to the year 2001. The Oceanographer of the Navy will jointly contribute resources to DMSO's seed money through FY98. In FY98, DMSO's funding will start decreasing as the Oceanographer of the Navy's contribution increases. Starting in FY99, the Oceanographer of the Navy will take full responsibility for supporting oceanographic requirements as the OEA.

Long-term investments will include continuation of several of the tasks listed below. These include MEL, TAOS, and LOTS support. Additional projects could include funding the conversion of FNMOC, OAML and Warfighting Support Center data to the SEDRIS standard, increasing the priority of V&V and Standards as the Requirements tasks are met, and combining the different data server algorithms into one unified server.

There are a number of efforts which the Ocean Executive Agent can leverage from to build a capability to support present needs for M&S

applications. Projects leading directly to a demonstrable capability are given a higher priority for immediate (FY96) funding. The following criteria were developed and used as checkpoints to near-term funding priorities:

1.   Does the project meet specific DOD MSMP objectives?
2.   Does the project have transition potential to operational activities?
3.   Is the project a short term, high payoff, low risk investment?
4.   Does the project minimize risks and start-up costs by leveraging off existing projects?
5.   Does the project address cross-service and cross-agency M&S requirements?
6.   Does the project provide unique approaches, methods, and solutions to meeting execution plan initiatives?

The OEA funding is being presented in two parts; programs which will be funded out of DMSO-supplied dollars, and programs which will be funded out of dollars from N096. The programs funded with DMSO dollars are Joint in nature. Those funded with N096 dollars are more oriented towards Navy-only M&S.

APPENDIX 4

REFERENCES

(1) DOD Directive 5000.59, DOD Modeling and Simulation (M&S) Management, 4 January 1994.

(2) DOD Modeling and Simulation Master Plan (MSMP), DOD 5000.59-P, 17 October 1995.

(3) Under Secretary of Defense (Acquisition and Technology) Memorandum, designating as DOD Modeling and Simulation (M&S) Executive Agent for the Ocean, TBD.

(4) Meteorological and Oceanographic Data for Modeling and Simulation, Reference Publication RP-2, Commander Naval Meteorology and Oceanography Command, November 1994.

APPENDIX 5

ACRONYMS AND ABBREVIATIONS USED IN THIS DOCUMENT

AAAV	Advanced Amphibious Assault Vehicle
AE*MAT	Advanced Electro-optical Model for Aerial Targeting
ACTD	Advanced Concept Technology Demonstration
AN/SPY	SPY 1 Radar
API	Application Program Interface
ARL/UT	Applied Research Laboratory/University of Texas
ARPA	Advanced Research Projects Agency
ASD (C3I)	Assistant Secretary of Defense (C3I)
BAA	Broad Agency Announcement
BFTT	Battle Force Tactical Trainer
C3I	Command Control and Intelligence
C4I	Command Control Computers and Intelligence
CASP	Computer Assisted Search Planning
CNA	Center for Naval Analysis
CNO	Chief of Naval Operations
COMNAVMETOCCOM	Commander, Naval Meteorology and Oceanography Command
CRADA	Cooperative Research And Development Agreement
CSEAL	Combat System Engineering Analysis System
CSMWTS	Combat System Multi-Warfare Tactical Scenarios
CSS	Coastal Systems Station
CSS	CSEAL Simulation System
CTAPS	Contingency Theater Automated Planning System
CWM	Composite Warfare Model
DDR&E	Director for Defense Research and Engineering
DEEM	Dynamic Environmental Effects Model
DFO/MULE	Direct Fire Observer/Multiple User Laser Equipment
DIS	Distributed Interactive Simulation
DMSO	Defense Modeling and Simulation Office
DOD	Department of Defense
DONMSMO	Department of the Navy Modeling and Simulation Management Office
DR	Data Repositories
E2dis	Environmental Effects for Distributed Interactive Simulations
EA	Executive Agent
EES	Environmental Effects on Sensors
ENWGS	Enhanced Naval Warfare Gaming Systems
EP	Exercise Participation
EREPS	Environmental Refractive Effects Prediction System
ETO	Education Training and Outreach
EVA	Environmental Acoustics
FAS	Fast Attack Submarine
FNMOC	Fleet Numerical Meteorology and Oceanography Center
GASS	Generic Acoustic Simulation System
HF-ATSS	High Fidelity Acoustic Time Series Simulator
HH-60J	Flight Trainer
HLA	High Level Architecture
HMMRSS	Helmet-Mounted Mission Rehearsal Simulation System
ICTDB	Integrated Computer Generated Force, Terrain Data Base
IREPS	Integrated Refractive Effects Prediction System
IRIAM	Integrated Radar and Infrared Analysis and Modeling
ITEM	Integrated Theater Engagement Model
ITI	Integrated Training Interface
JCOS	Joint Counter Mine Operational Simulation
JCS	Joint Chiefs of Staff

JHU/APL	Johns Hopkins University/ Applied Physics Lab
JLOTS	Joint Logistics Over The Shore
JMASS	Joint Modeling And Simulation System
JSIMS	Joint Simulation System
LOTSSS	Logistics Over The Shore Site Selection
LOTS	Logistics Over The Shore
M&S	Modeling and Simulation
MARS	Mine Warfare Simulation Project
MCMSMO	Marine Corps Modeling and Simulation Management Office
MEL	Master Environmental Library
MERIT	Mission Environmental Requirements Integration Technology
METOC	Meteorology and Oceanography
MFS	Manned Flight Simulator
MSCC	Modeling and Simulation Coordinating Committee
MSMP	Modeling and Simulation Master Plan
MSSD	Model Simulation and Stimulation Development
MTWS	MAGTF Tactical Warfare Simulator
MWAR	Maneuver-Warfare Analytical Research System
NABEM II	Naval Air Battle Evaluation Model
NASA	National Air and Space Agency
NASC	Naval Air Systems Command
NAVAIR	Naval Air
NAVMSMO	Navy Modeling and Simulation Management Office
NAVOCEANO	Naval Oceanographic Office
NAWC -WD	Naval Air Warfare Center-Weapons Division
NAWC- AD	Naval Air Warfare Center/ Aircraft Division
NAWC-TSD	Naval Air Warfare Center - Training Systems Division
NCCOSC	Naval Command Control and Ocean Surveillance Center
NOAA	National Oceanographic and Atmospheric Agency
NRaD	Naval Research and Development
NRL	Naval Research Laboratory
NSS	Naval Simulation System
NSW	Naval Surface Warfare
NSWC	Naval Surface Warfare Center
NUWC	Naval Undersea Warfare Center
OAML	Oceanographic and Atmospheric Master Library
OEA	Ocean Executive Agent
ONR	Office of Naval Research
RPO	Radar Physics Optics
RDA	Requirements Definition and Analysis
RESA	Research Evaluation and Systems Analysis
RSCES	AEGIS Radar System Controller Environmental Simulation
SAF	Semi-Automated Forces
SCCIWI (SPAWAR) (formally	Space, Command, Control and Information Warfare Command
	Space and Naval Warfare Systems Command)
SEDRIS	Synthetic Environment Data Representation and Interchange
Specification	
SEWSIM	Space and Electronic Warfare Simulator
SIF	System Integration facilities
STOW	Synthetic Theater of War
TACDEWEGSC	Tactical Advanced Combat Direction and Electronic Warfare, Environmental Generation and Control System
TACTRAGRULANT	Tactical Training Group, Atlantic
TACTRAGRUPAC	Tactical Training Group, Pacific
TAMPS	Tactical Aircraft Mission Planning System
TAOS	Total Atmospheric and Oceanographic System
TASC	The Analytic Sciences Corporation

TEC	Topographic Engineering Center
TIA	Transportation Infrastructure Assessment
TLAM	Tomahawk Land Attack Missile
TOSL	Tactical Ocean Simulation Laboratory
TRAGRULANT	Training Group, Atlantic
TTES	Team Target Engagement Simulator
USD(A&T)	Under Secretary of Defense for Acquisition and Technology
V&V	Verification and Validation
VLSTRACK	Chemical/Biological/Agent Vapor, Liquid, and Solid Tracking
VV&A	Verification, Validation and Accreditation
VV&C	Verification, Validation and Certification
WAF	Weapons Analysis Facility
WARSIMS 2000	War Fighter Simulation (Year 2000)
WES	Waterways Experimental Station
WINDS	Weather In DIS